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(54) **Prehensile anti-torque and simultaneous support for power tool**

Drehmomentsperren-Griff und gleichzeitige Stütze für ein Elektrowerkzeug

Support simultané et anticouple de préhension pour outil électrique

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(56) References cited:
**DE-C1- 3 704 202 US-A- 1 477 355
US-A- 1 607 929**

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Description

TECHNICAL FIELD

[0001] The present invention relates to an anti-rotation device for a fastener. Specifically, the present invention relates to a device that limits the rotation of a fastener when tightening or loosening the corresponding fastener.

BACKGROUND

[0002] A gas turbine engine has several modules. The first module, in terms of axial flow path, is the compressor section. Ambient air enters the engine through the compressor section. The compressor section pressurizes the air.

[0003] The second module is the combustion section. The combustion section introduces fuel to the air previously compressed by the compressor section. The combustion section then ignites the mixture.

[0004] The third module is the turbine section. The turbine section extracts energy from the exhaust produce by the compressor section. The turbine section is coupled to the compressor section so that the exhaust drives the compressor.

[0005] Finally, the air exits the engine as thrust.

[0006] FIG. 1 is a perspective view of part of a gas turbine engine 210. The drawing shows a first module, such as a compressor section 211, adjacent a second module, such as a combustion section 213. The cases of these sections 211, 213 have corresponding flanges 215, 217 which abut and define a joint 219.

[0007] Fasteners, such as 12-point bolts 221 and nuts 223, extend through aligned openings in the flanges 215, 217 to seal the joint 219. FIG. 1 displays the conventional method of tightening the bolts 221 and nuts 223. The typical method requires the operator first to manipulate both a manual wrench W and a pneumatic impact wrench I. The manual wrench W engages the nut 223 and the pneumatic wrench I engages the bolt 221. After actuating the impact wrench I, the operator prevents rotation of the nut 223 by applying torque to the wrench W. As the bolt 221 and nut 223 tighten, the operator must apply an increasing amount of torque to the wrench W. The operator replaces the impact wrench I with another manual wrench W to provide the final torque to the fasteners. Now, the operator must apply torque to both manual wrenches W.

[0008] Loosening the bolts 221 and nuts 223 is similar. The operator engages the nut 223 with the wrench W and the bolt 221 with the second manual wrench W. The operator applies torque to both manual wrenches to loosen the fasteners slightly. Then operator then replaces the second manual wrench W with the impact wrench I. The operator then actuates the impact wrench I to remove the loosened bolt 221. The operator applies the greatest amount of torque to the wrench W during initial loosening of the fasteners. As the bolt 221 and the nut 223 loosen further, the operator can apply a decreasing amount of

torque to the wrench W.

[0009] The operator must apply a typical torque of between approximately 30 and approximately 1000 in-lbs (113 Nm). Since the joint 19 may have up to 160 pairs of bolts 221 and nuts 223, the possibility of operator fatigue does exist. Since the engine 210 may have at least four joints 219, the possibility of fatigue becomes even more apparent.

[0010] A tool having the features of the preamble of claim 1 is disclosed in DE 3704202 C1. Other tools having attachments are disclosed in US 1477355 A and US 1607929 A.

SUMMARY

[0011] According to the invention, there is provided a tool for assembling parts to be connected to each other, as set forth in claim 1.

[0012] According to the invention, there is also provided a method for attaching a plurality of work pieces with a bolt, as set forth in claim 12.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Figure 1 is prior art view of a methodology for attaching bolts to an aircraft component.

Figure 2 is a top view of a tool which falls outside the scope of the invention.

Figure 3 is a side view of the tool of Figure 1.

Figure 4 is a view of a clamp used in Figures 2 and 3. Figure 5 shows a view of the tool of Figure 1 being used.

Figure 6 shows a variant of the tool of Figure 1 which falls outside the scope of the invention.

Figure 7 shows a side view of the tool of Figure 6.

Figure 8 shows a still further variant of the tool of Figure 1 in accordance with the invention.

Figure 9 shows a variant of a clamp for use with the tool of Figure 8.

Figure 10 shows a further tool which falls outside the scope of the invention.

Figure 11A shows a first non-limiting embodiment of a fastener holder that may be exemplarily used herein.

Figure 11B shows a second non-limiting embodiment of a fastener holder that may be exemplarily used herein.

Figure 11C shows a third non-limiting embodiment of a fastener holder that may be exemplarily used herein.

Figure 11D shows a fourth non-limiting embodiment of a fastener holder that may be exemplarily used herein.

Figure 11E shows a fifth non-limiting embodiment of a fastener holder that may be exemplarily used herein.

Figure 11F shows a sixth non-limiting embodiment of a fastener holder that may be exemplarily used herein.

Figure 12 shows a second embodiment of the fastener holder that may be used with the embodiments disclosed herein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] Referring now to Figures 2-4, a schematic tool 10 which falls outside the scope of the invention, such as a driver or a wrench, is shown herein. The tool 10 includes a motor portion 15 connected to a neck 20 that connects in turn to a transverse gearing portion 25 that connects to a vertically disposed chuck 30 that holds a driver 35.

[0015] An attachment, such as a clamp 37, has a left half 40 and a right half 45. A semi-circular recess 50 is disposed in the left half 40, and a semi-circular recess 55 is disposed in the right half 45. The semi-circular portion 50 is in register with the semi-circular portion 55 to encircle the neck 20 which may have a tapered shape. A tensioning bolt 60 keeps the right half 45 and the left half 40 together to engage the neck 20 securely. Each half 40, 45 has a pivot hole 65 that holds a pivot pin 70.

[0016] A flange 75, which acts as a connector, has a hole 77 therein for receiving the pivot pin 70 to allow the flange 75 to rotate relative to the clamp 37. The flange 75 also attaches/connects to a fastener holder 80. One of ordinary skill in the art will also recognize that other ways to hold the flange 75 for rotation relative to the clamp 37 (and at different positions therein) are within the teachings herein.

[0017] Referring to Figure 5, flanges 215 and 217 of the engine 210 are to be connected by a threaded bolt 90, which has a bolt head 95, and a fastener 100, such as a nut that screws onto the bolt 90. The tool 10 is tilted downwardly and the fastener holder 80 is placed over the fastener 100 to prevent the fastener 10 from rotating. The tool 10 is then rotated clockwise about the pivot pin 70 to have the drive 35 engage bolt, in this case through its head 95. Once the bolt head 95 is engaged with the driver 35, the tool 10 may be activated to rotate/manipulate the entire bolt 90 into the fastener 100 so that the bolt and nut are securely fastened without rotation of the fastener 100. The tool 10 may be a torque wrench and the bolt will then be securely fastened to the fastener without significant variation to the torque required. One of ordinary skill in the art will recognize from the teachings herein that other types of bolts or pins, including bolts without heads, may be utilized to connect the flanges 215, 217.

[0018] Referring now to Figures 6 and 7, one can see now that the flange 75 has an extension 105 that ends in a thumb portion 110. A spring 115 is disposed between the motor portion 15 and the extension 105 to urge the fastener holder 80 into contact with the fastener 100 if

the extension 105 and thumb portion 110 are not manipulated by the user. The spring 115, which may also be a linear spring (not shown), is securely attached to the lever 105 and the tool 20 to minimize foreign object damage to any parts. Additionally, the spring may be a torsional spring (not shown) attached to the pin 70. The flange 75 can now be manipulated by the thumb of a user holding the tool 10 and manipulating the thumb portion 110 so that one's other hand may be used to align the bolt 90 and the fastener 100. One hand operation can greatly speed the installation of nuts and bolts and minimize user fatigue. There is no longer any need to use a wrench W, as shown in Figure 1.

[0019] Referring now to Figures 8 and 9 it is seen that the driver shown herein is in accordance with the invention and is adjustable for differing situations a user may encounter. The flange 75 and its extension 105 may be adjusted to pivot around openings 120 that are placed in each clamp half 40, 45 radially outboard from an axis 147 along which the tool 10 is disposed. This gives the tool the ability to secure flanges 215 and 217 to each other as shown in Figure 5 that may be thicker and require longer bolts than as shown in Figure 1. A quick release pin 125, which may screw into openings 120 or 65, may extend through the flange 75 and allow rotation thereabout at differing location radial locations along the clamp 37. The quick release pin 125 may be attached to the clamp by a lanyard 127 by conventional means to minimize foreign object damage to a part 210 or loss of the quick release pin 125. One of ordinary skill will recognize that the openings 120 may be designed for the thickness of the flanges 215, 217 and the lengths of the bolts 90.

[0020] Flange 75 may also have additional openings 137 to allow for more than one pivot point of the flange 75 and the extension 105 to adjust for lower degrees or articulation as may be required. To use such an opening 137, the quick release pin 125 is removed from the opening 77, as is shown, or any of the holes 120, from opening 77 and reinserted in opening 137 and in any of openings 77 or openings 120 as may be required. Furthermore, as indicated by arrow A, the clamp screws 135 and 60 may be loosened to move forward or backwardly, as each application may require, to enable fastener holder 80 to engage fastener 100. One of ordinary skill in the art will readily understand given the teachings herein, that the clamp 37 may have different openings in different places and the flange 75 and extension 105 may have holes in variable positions depending on necessities of the flanges 215, 217 and holders 80 and bolts 90 to be used. One of ordinary skill in the art will also recognize that other ways to hold the flange 75 for rotation relative to the clamp 37 along a length of the flange 75 are within the teachings herein.

[0021] One can see in Figure 2 that a 12 point socket wrench 85 acts as the fastener holder 80. However, referring now to Figures 11A-11F, other shapes of fastener holders 80 may be used. For instance an Allen head 150, a box end 155, an open end 160, a flare nut end 165, a

non-ratchet head 170, or a reversible ratchet 175, or any other fastener holder may be used. One of ordinary skill in the art will readily recognize that other shapes may be chosen for the use at hand.

[0022] Referring now to Figure 10, a further tool which falls outside the scope of the invention is shown here. In this embodiment the transverse gearing portion 25 is removed so that the driver 35 acts to rotate in plane with the driver 110 along axis 147. The embodiment in this instance is similar in all aspects to the tool 10 of the previous embodiment except that the flange 75 now has a portion 145 extending at a right angle to the axis 147 and to the flange 75. The portion 145 now attaches to the fastener holder 80 that aligns with the driver 35, the bolt 90 and the fastener 100 for assembly along that axis. One of ordinary skill in the art will readily recognize that other orientations between the driver 35 and the tool 10 are possible by providing the proper bend to the flange 75. In this embodiment, the clamp 37 may slide along the neck 20 to account for the proper thicknesses of any vertically disposed flanges (not shown).

[0023] Referring now to Figure 12, the holder 80 is shown having a shaped, non-circular opening 180 including a keyhole 185, an insert 190 having a twelve-point grip 192 for holding a fastener 100 (see Fig. 5) and a key 195 for mating with keyhole 185 such that the insert 190 does not rotate relative to the holder 80. A shelf or other mechanism prevents the insert 190 from passing through the insert 80. One of ordinary skill in the art will also recognize that other ways to hold the insert 190 within the holder 80 are within the teachings herein.

[0024] One of ordinary skill in the art will also recognize that the tool 10 shown herein may also rotate the nut 223 while preventing the bolt 221 from rotation.

[0025] Although an embodiment of this invention has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.

Claims

1. A tool (10) for assembling parts to be connected to each other, said tool comprising:

a body (15,20) for rotating one of a bolt (90) or a fastener (100), said bolt (90) having a first end and a second end,

a holder (80) attaching to said body (15,20) for holding an other of said bolt (90) or said fastener (100), against rotation and in alignment with said second end of said bolt (90) wherein said other of said bolt (90) or said fastener (100) does not rotate while said second end of said bolt (90) receives said fastener (100), wherein said holder (80) comprises an attachment (37) attaching

to said body (15,20) and a connector (75) rotatably attached to said attachment (37), said connector (75) attaching to said holder (80) remotely from said attachment (37); **characterised in that:**

said attachment (37) has a plurality of positions along a length, normal to said connector (75), thereof for attaching said connector (75) thereto at different positions along said attachment length.

2. The tool of claim 1 wherein said attachment comprises a clamp (37) that grips said body (15,20).
3. The tool of claim 2 wherein said clamp (37) clamps onto a neck (20) of said body.
4. The tool of claim 1, 2 or 3 wherein said connector (75) is bent.
5. The tool of any of claims 1 to 4 wherein said connector (75) has a plurality of positions along a length thereof for attaching at different positions along its length to said attachment (37).
6. The tool of any of claims 1 to 5 further comprising said connector (75) having an extension (105) for manipulation by a user to rotate said connector (75), or further comprising a lever attaching to said connector (75) for rotating said connector (75) away from said one of said one of a first end of said bolt (90) and said second end of said bolt (90) or said fastener (100).
7. The tool of claim 6 further comprising a spring (115) for urging said lever or extension towards said one of said one of a first end of said bolt (90) and said second end of said bolt (90) or said fastener (100).
8. The tool of any preceding claim wherein said holder (80) may slide along said body (15,20) for adapting to a thickness of a workpiece.
9. The tool of any preceding claim wherein said holder (80) includes an opening (180) having a non-circular shape for receiving an insert (190) having an outer shape mating with said non-circular shape and an inner shape for engaging said fastener (100), wherein, for example, said non-circular shape includes a key-hole (185) and said circular shape includes a key (195), and/or wherein said body (15,20) prevents said insert (190) from falling out of it.
10. The tool of any preceding claim further comprising a driver (35) attached to said body (15,20) for engaging said first end of said bolt (90) or said fastener (100), said driver (35) and said bolt (90) or said fastener (100) disposed along an axis.

11. The tool of any of claims 1 to 10 further comprising a driver (35) attached to said body (15,20) for engaging said first end of said bolt (90), wherein said driver (35) and said bolt (90) are not disposed along an axis, for example wherein said driver (35) and said body (15,20) are disposed at about a 90 degree angle to each other.

12. Method for attaching a plurality of work pieces with a bolt (90), said method comprising:

providing a tool of any preceding claim, gripping said one of said first end of said bolt (90) or said fastener (100) with said holder (80) against rotation, and driving one of said first ends of said bolt (90) or said fastener (100), said second end of said bolt (90) being received by said fastener (100).

Patentansprüche

1. Werkzeug (10) zum Montieren von Teilen, die miteinander verbunden werden müssen, wobei das Werkzeug folgendes umfasst:

einen Körper (15,20) zum Drehen eines einer Schraube (90) oder eines Verbindungselements (100), wobei die Schraube (90) ein erstes Ende und ein zweites Ende hat, eine Haltevorrichtung (80), die am Körper (15,20) befestigt ist, zum Halten einer weiteren der Schraube (90) oder des Verbindungselements (100) gegen Drehung und in einer Linie mit dem zweiten Ende der Schraube (90), wobei die andere der Schraube (90) oder des Verbindungselements (100) sich nicht dreht, während das zweite Ende der Schraube (90) das Verbindungselement (100) aufnimmt, wobei die Haltevorrichtung (80) ein am Körper (15,20) befestigtes Zusatzteil (37) und einen Stecker (75) hat, der drehbar am Zusatzteil (37) befestigt ist, wobei der Stecker (75) entfernt vom Zusatzteil (37) an der Haltevorrichtung (80) befestigt ist; **dadurch gekennzeichnet, dass** das Zusatzteil (37) eine Vielzahl an Positionen entlang einer für den Stecker (75) normalen Länge hat, an denen der Stecker (75) an unterschiedlichen Positionen entlang der Länge des Zusatzteils befestigt werden kann.

2. Werkzeug nach Anspruch 1, wobei das Zusatzteil eine Klemmvorrichtung (37) umfasst, die den Körper (15,20) umgreift.

3. Werkzeug nach Anspruch 2, wobei die Klemmvorrichtung (37) um einen Hals (20) des Körpers greift.

4. Werkzeug nach Anspruch 1, 2 oder 3, wobei der Stecker (75) gebogen ist.

5. Werkzeug nach einem der Ansprüche 1 bis 4, wobei der Stecker (75) eine Vielzahl an Positionen entlang einer Länge davon zur Befestigung am Zusatzteil (37) an unterschiedlichen Positionen entlang seiner Länge hat.

6. Werkzeug nach einem der Ansprüche 1 bis 5, ferner umfassend den Stecker (75), der eine Verlängerung (105) zur Handhabung durch einen Anwender zum Drehen des Steckers (75) besitzt, oder ferner umfassend einen am Stecker (75) befestigten Hebel zum Drehen des Steckers (75) weg von dem einen des einen ersten Endes der Schraube (90) und des zweiten Endes der Schraube (90) oder des Verbindungselements (100).

7. Werkzeug nach Anspruch 6, ferner umfassend eine Feder (115), um den Hebel oder die Verlängerung zu dem einen des einen ersten Endes der Schraube (90) und des zweiten Endes der Schraube (90) oder des Verbindungselements (100) zu forcieren.

8. Werkzeug nach einem der vorhergehenden Ansprüche, wobei die Halterung (80) zur Anpassung an eine Dicke eines Werkstücks entlang des Körpers (15,20) gleiten kann.

9. Werkzeug nach einem der vorhergehenden Ansprüche, wobei die Halterung (80) eine Öffnung (180) mit einer unrunder Form zur Aufnahme eines Einsatzes (190) mit einer äußeren Form, die der unrunder Form entspricht, und einer inneren Form zum Einrasten der Halterung (100) beinhaltet, wobei, zum Beispiel, die unrunde Form ein Schlüsselloch (185) beinhaltet und die runde Form einen Schlüssel (195) beinhaltet und/oder wobei der Körper (15,20) verhindert, dass der Einsatz (190) daraus herausfällt.

10. Werkzeug nach einem der vorhergehenden Ansprüche, ferner umfassend einen am Körper (15,20) befestigten Treiber (35) zum Einrasten des ersten Endes der Schraube (90) oder des Verbindungselements (100), wobei der Treiber (35) und die Schraube (90) oder das Verbindungselement (100) entlang der Achse angeordnet sind.

11. Werkzeug nach einem der Ansprüche 1 bis 10, ferner umfassend einen am Körper (15,20) befestigten Treiber (35) zum Einrasten des ersten Endes der Schraube (90), wobei der Treiber (35) und die Schraube (90) nicht entlang der Achse angeordnet sind, zum Beispiel wobei der Treiber (35) und der Körper (15,20) in einem Winkel von etwa 90 Grad zueinander angeordnet sind.

12. Verfahren zum Befestigen einer Vielzahl an Werkstücken mit einer Schraube (90), wobei das Verfahren folgendes umfasst:

Bereitstellen eines Werkzeugs nach einem der vorhergehenden Ansprüche,
Greifen des einen des ersten Endes der Schraube (90) oder des Verbindungselements (100) mit der Halterung (80) zum Sichern gegen Drehung, und
Treiben des einen des ersten Endes der Schraube (90) oder des Verbindungselements (100), wobei das zweite Ende der Schraube (90) von dem Verbindungselement (100) aufgenommen wird.

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Revendications

1. Outil (10) pour assembler des pièces devant être reliées les unes aux autres, ledit outil comprenant :

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un corps (15, 20) pour faire tourner l'un d'un boulon (90) ou d'un élément de fixation (100), ledit boulon (90) ayant une première extrémité et une seconde extrémité,
un support (80) attaché audit corps (15, 20) pour maintenir un autre dudit boulon (90) ou dudit élément de fixation (100), contre la rotation et en alignement avec ladite seconde extrémité dudit boulon (90), dans lequel ledit autre dudit boulon (90) ou dudit élément de fixation (100) ne tourne pas alors que ladite seconde extrémité dudit boulon (90) reçoit ledit élément de fixation (100), dans lequel ledit support (80) comprend un élément d'attachement (37) attaché audit corps (15, 20) et un connecteur (75) attaché de manière rotative audit élément d'attachement (37), ledit connecteur (75) étant attaché audit support (80) à distance dudit élément d'attachement (37) ; **caractérisé en ce que** :
ledit élément d'attachement (37) présente une pluralité de positions le long d'une longueur de celui-ci, normale audit connecteur (75), pour attacher ledit connecteur (75) à celui-ci à différentes positions le long de ladite longueur d'attachement.

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2. Outil selon la revendication 1, dans lequel ledit élément d'attachement comprend un collier (37) qui saisit ledit corps (15, 20).

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3. Outil selon la revendication 2, dans lequel ledit collier (37) assure le serrage sur un col (20) dudit corps.

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4. Outil selon la revendication 1, 2 ou 3, dans lequel ledit connecteur (75) est recourbé.

5. Outil selon l'une quelconque des revendications 1 à 4, dans lequel ledit connecteur (75) présente une pluralité de positions le long d'une longueur de celui-ci pour attachement à différentes positions le long de sa longueur audit élément d'attachement (37).

6. Outil selon l'une quelconque des revendications 1 à 5, comprenant en outre la présence sur ledit connecteur (75) d'un prolongement (105) pour manipulation par un utilisateur pour faire tourner ledit connecteur (75), ou comprenant en outre la fixation d'un levier audit connecteur (75) pour faire tourner ledit connecteur (75) à l'écart de ladite une d'une première extrémité dudit boulon (90) et de ladite seconde extrémité dudit boulon (90) ou dudit élément de fixation (100).

7. Outil selon la revendication 6 comprenant en outre un ressort (115) pour forcer ledit levier ou prolongement vers ladite une d'une première extrémité dudit boulon (90) et de ladite seconde extrémité dudit boulon (90) ou dudit élément de fixation (100).

8. Outil selon une quelconque revendication précédente, dans lequel ledit support (80) peut coulisser le long dudit corps (15, 20) pour adaptation à une épaisseur d'une pièce à usiner.

9. Outil selon une quelconque revendication précédente, dans lequel ledit support (80) inclut une ouverture (180) ayant une forme non circulaire pour recevoir un insert (190) ayant une forme externe s'accouplant avec ladite forme non circulaire et une forme interne pour mise en prise avec ledit élément de fixation (100), dans lequel, par exemple, ladite forme non circulaire inclut un trou de serrure (185) et ladite forme circulaire inclut une clé (195), et/ou dans lequel ledit corps (15, 20) empêche ledit insert (190) de tomber hors de celui-ci.

10. Outil selon une quelconque revendication précédente, comprenant en outre un élément d'entraînement (35) attaché au corps (15, 20) pour mise en prise avec ladite première extrémité dudit boulon (90) ou dudit élément de fixation (100), ledit élément d'entraînement (35) et ledit boulon (90) ou ledit élément de fixation (100) étant disposés le long d'un axe.

11. Outil selon l'une quelconque des revendications 1 à 10, comprenant en outre un élément d'entraînement (35) attaché audit corps (15, 20) pour mise en prise avec ladite première extrémité dudit boulon (90), dans lequel ledit élément d'entraînement (35) et ledit boulon (90) ne sont pas disposés le long d'un axe, par exemple, dans lequel ledit élément d'entraînement (35) et ledit corps (15, 20) sont disposés à un angle de 90 degrés environ l'un par rapport à l'autre.

12. Procédé d'attachement d'une pluralité de pièces à usiner avec un boulon (90), ledit procédé comprenant :

la fourniture d'un outil selon une quelconque revendication précédente, 5
le maintien de ladite une de ladite première extrémité dudit boulon (90) ou dudit élément de fixation (100) avec ledit support (80) contre la rotation, et 10
l'entraînement d'une desdites premières extrémités dudit boulon (90) ou dudit élément de fixation (100), ladite seconde extrémité dudit boulon (90) étant reçue par ledit élément de fixation (100). 15

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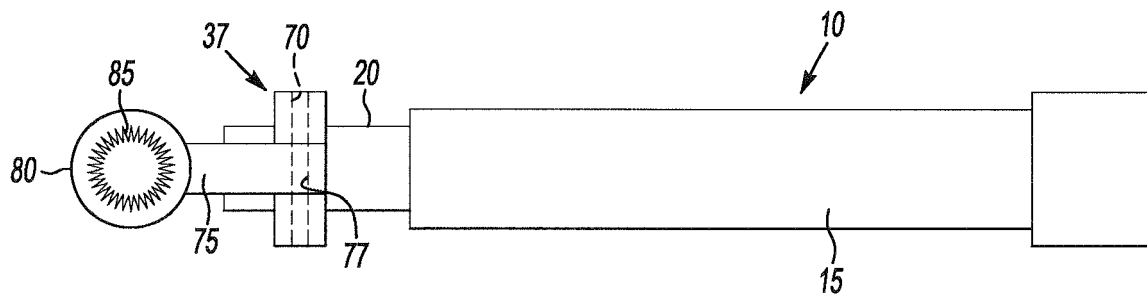
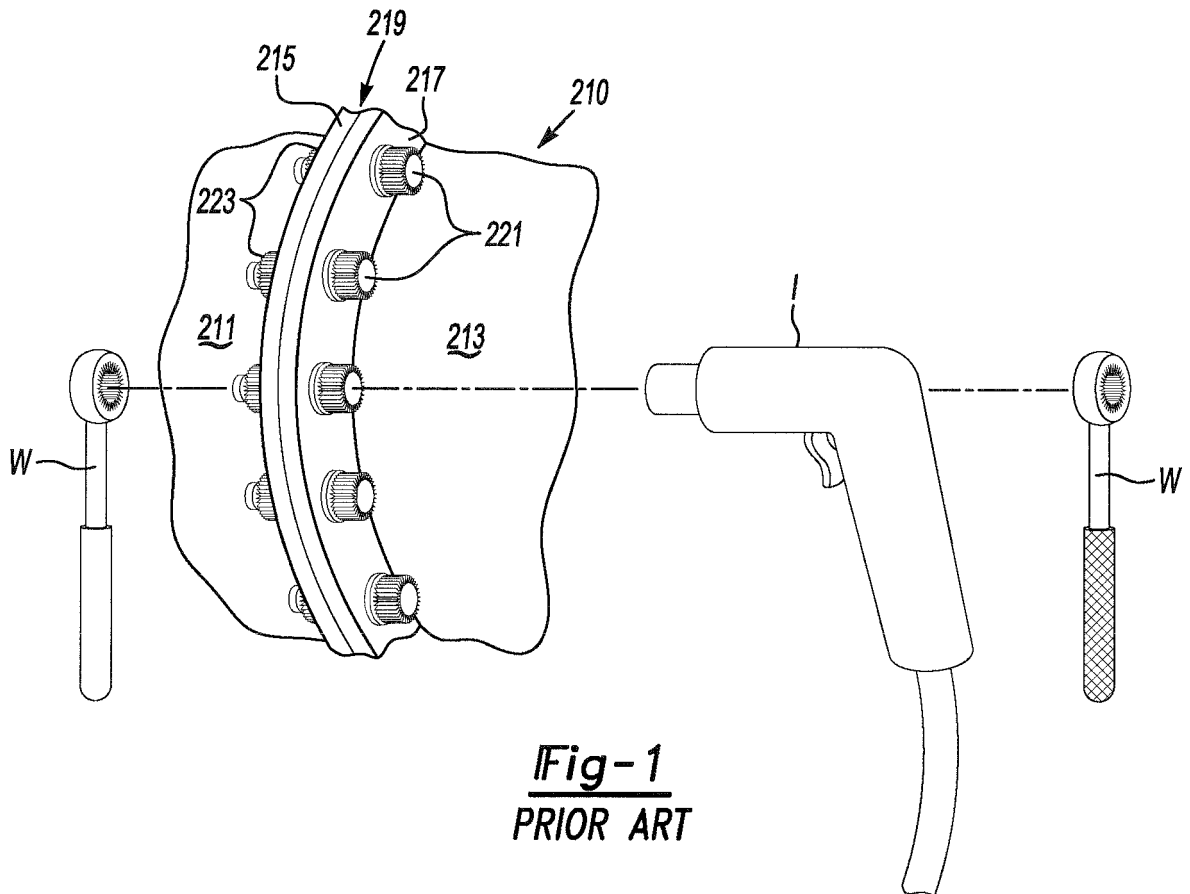
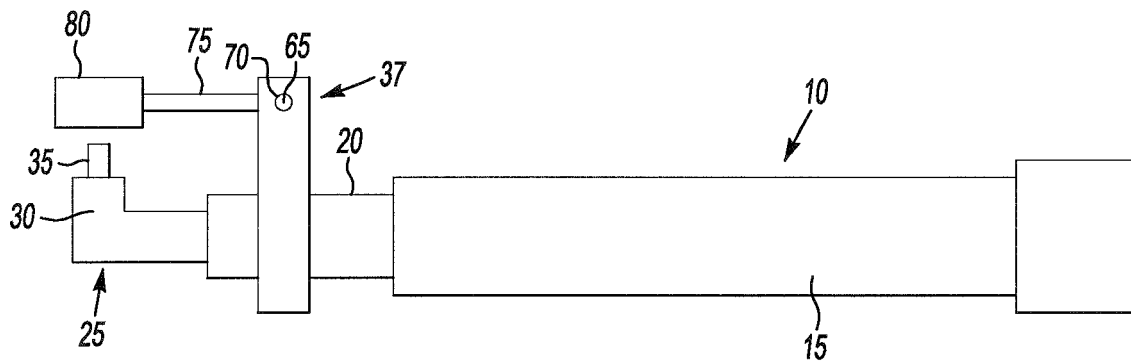


Fig-2



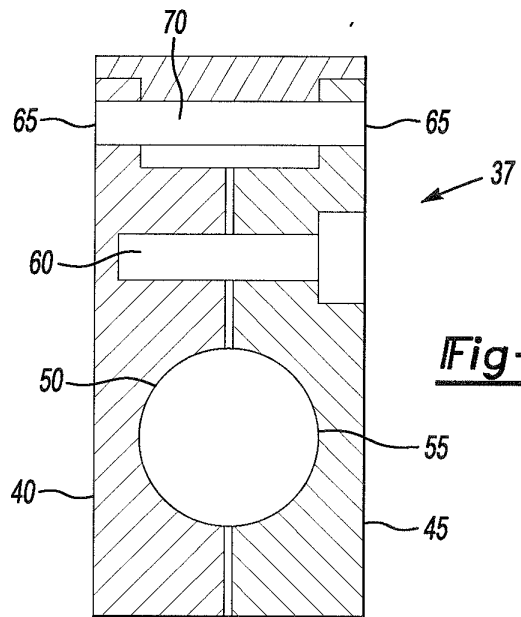


Fig-4

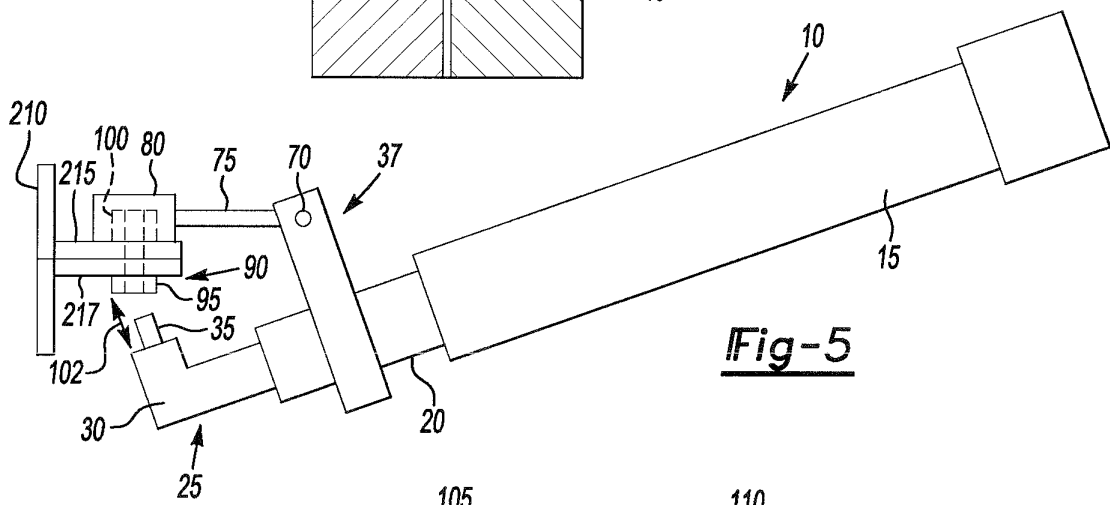


Fig-5

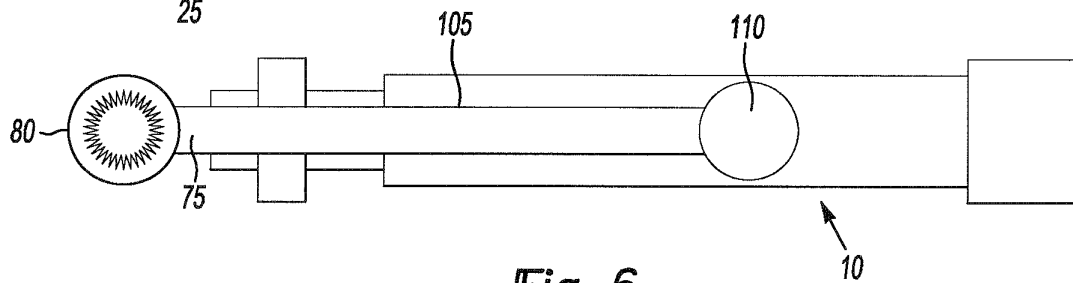


Fig-6

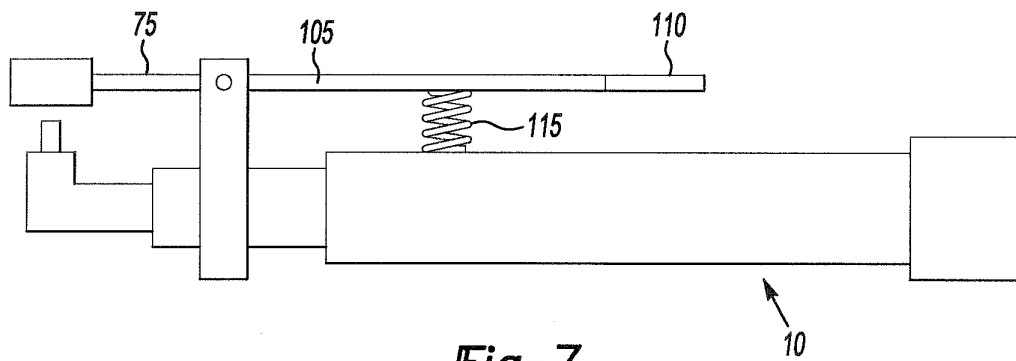
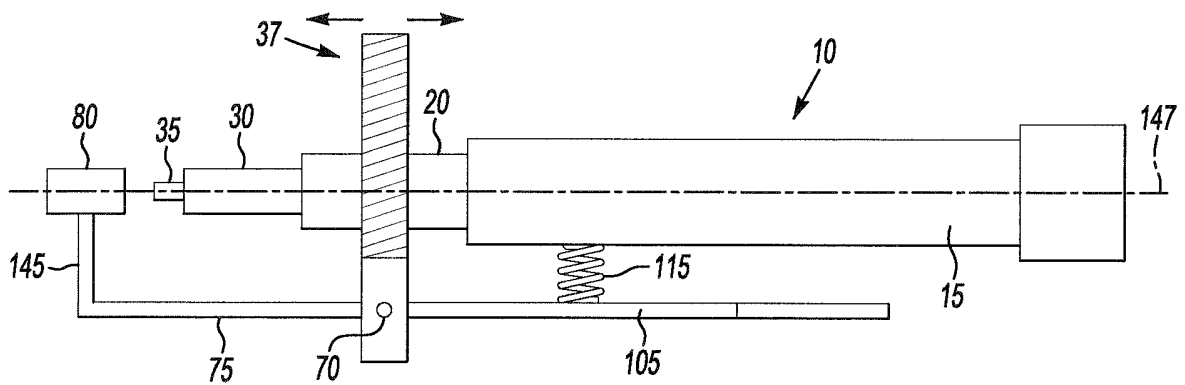
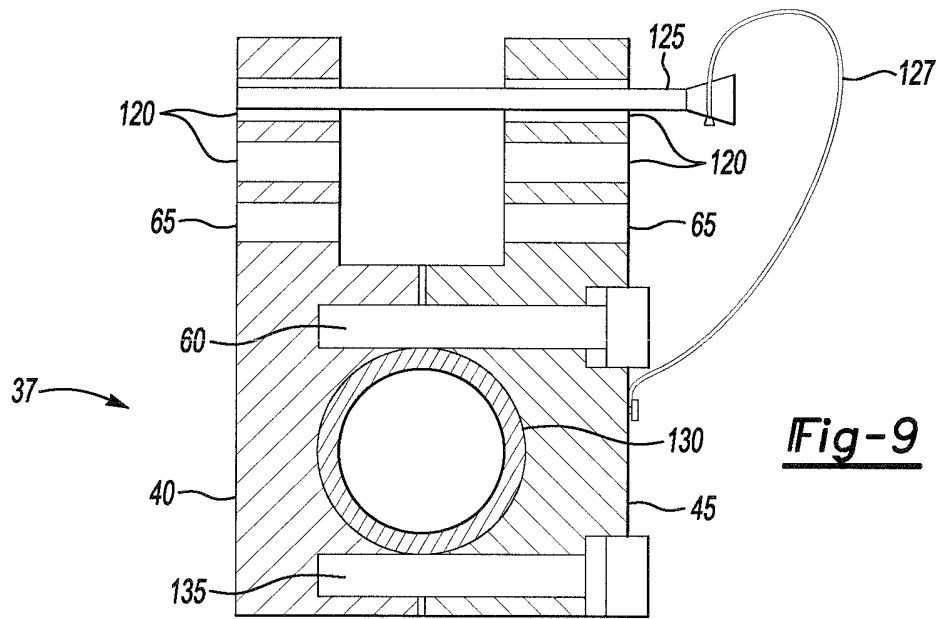
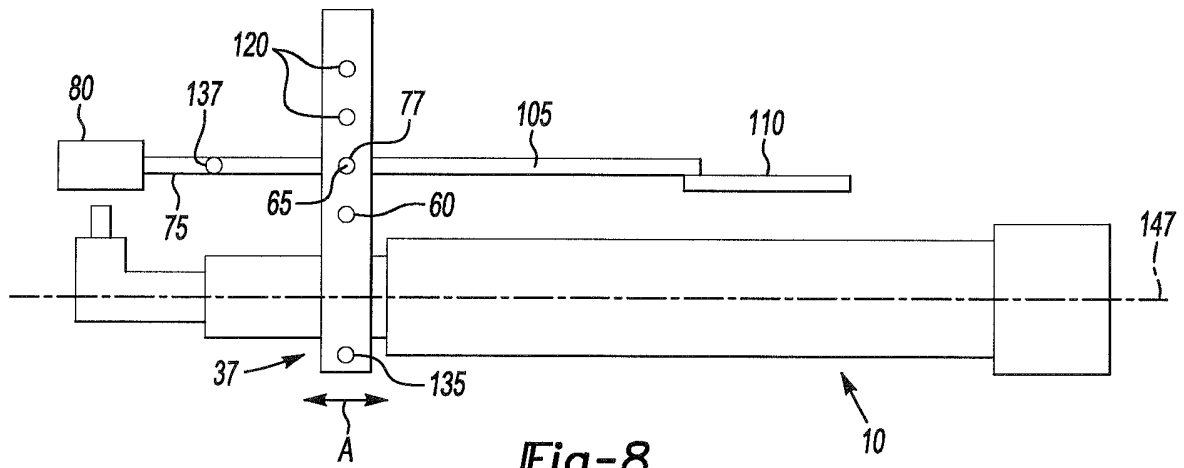


Fig-7



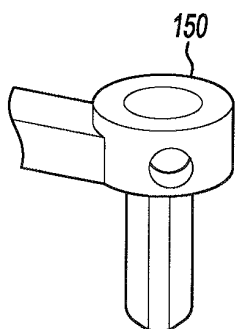


Fig-11A

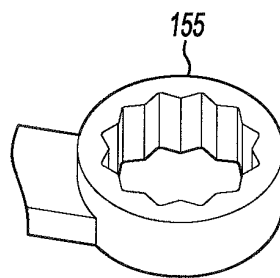


Fig-11B

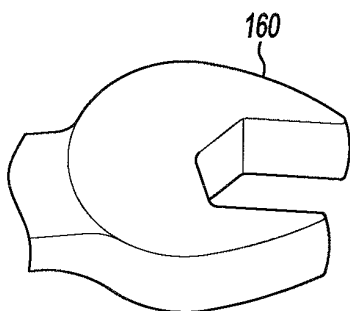


Fig-11C

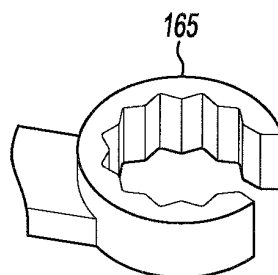


Fig-11D

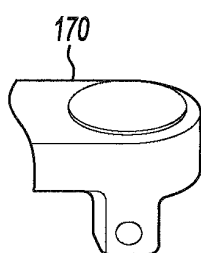


Fig-11E

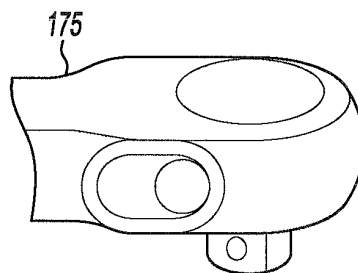


Fig-11F

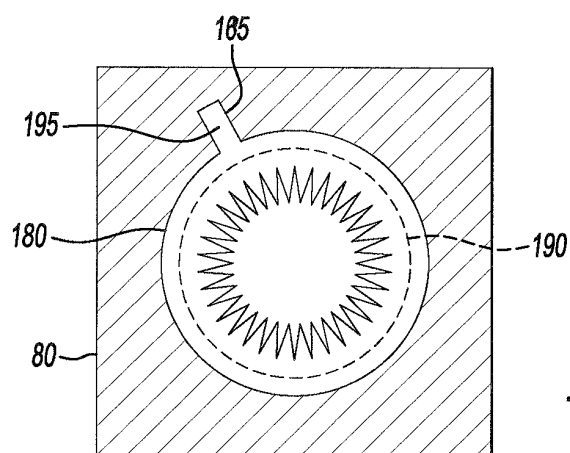


Fig-12

REFERENCES CITED IN THE DESCRIPTION

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